

Growth Data as Indicators of Social Inequalities: The Case of Poland

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ABSTRACT Recent studies of the effects of socioeconomic stratification on stature and age at menarche in Poland are reviewed. The data are derived from a survey of conscripts in 1976, three nationwide growth surveys in 1955, 1966, and 1978, and several surveys of the timing of menarche. The data indicate a clear social gradient in stature during childhood, youth, and young adulthood, and in the age at menarche. Individuals from the larger urban centers and small families with college-educated fathers, on the average, tend to be the tallest and to mature earliest, while those from peasant (farmers) families are at the opposite extreme in size and maturity. Also, the data show marked secular trends towards increased stature and earlier maturation. The influence of social variables underlying the socioeconomic stratification, i.e., income, family size, education, occupational status, and urbanization, are discussed relative to their effects on growth and maturation of Polish children.

Since the first surveys of the statures of children and military conscripts and of menarcheal age were undertaken in Western Europe in the first half of the 19th century, it has been recognized that growth data provide a good indicator of the degree of social and economic deficits suffered by the underprivileged strata in a society. Indeed, it was exactly the increasing awareness of such neglect, particularly the awareness of the dreadful condition of the working class in early 19th century Europe, that provided the main impulse for undertaking the first modern growth studies in the 1830s by Stanway, Horner, and Robertson in England, and by Villerme in France (Tanner, 1981).

Although present-day industrial societies of Europe and United States are considerably different from those of 150 years ago, socioeconomic stratification is still reflected in the growth and maturation of children and youth in many such societies. Children from upper social strata, whether defined in terms of income, education, or occupational status, generally tend to be taller than their peers from lower strata at all ages, and tend to mature earlier and experience the adolescent growth spurt earlier (cf, Eveleth and Tanner, 1976). There are of course exceptions, for example, in Sweden (Lindgren, 1976, 1981) and the United States (Hamill et al., 1972; MacMahon, 1973) social class differences in growth and maturation are negligible. Because the timing of the adolescent growth spurt generally varies by social class, social class differences in stature are greatest during adolescence. After adolescence, the differences are less, but usually do not disappear. A detailed analysis of the age-associated reduction of social class differences in the stature of Polish conscripts measured in the last quarter of the 19th century and the first decade of the 20th century was provided by Czekanowski (1930). The data also demonstrated marked statural differences between conscripts from gentry families and those of peasant stock, the former being significantly taller. Czekanowski strongly emphasized the ecosensitivity of stature and attempted to demonstrate that the small secular fluctuations in mean statures of conscripts were a reflection of subtle changes in the economic situation of Poland.

The sensitivity of growth and maturation to various factors in the social environment is quite remarkable. For example, age at menarche in Poland in the 1960s and 1970s, differed significantly not only between urban and rural girls, but also among a variety of more subtle comparisons; such as, girls from small nonindustrial towns versus those from neighboring villages; girls whose fathers had an elementary education versus those with an elementary education plus two years of vocational school; girls whose fathers were small-town craftsmen versus those whose fathers were nonmanual workers resident in the same town; daughters of full-time farmers versus those of part-time farmers resident in the same county. With education and family size controlled, girls whose fathers lived in big cities versus those whose fathers lived in small towns had a significantly younger age at menarche. With nutritional status controlled, daughters of urban skilled manual workers from a rural background living in a city for less than 15 years had a significantly later age at menarche than those whose fathers had the same job and background but who lived in a city for 15 to 20 years (Milicer, 1968; Wolański, 1970; Piasecki and Waliszko, 1975; Urbańczyk, 1979; Bielicki et al., 1981b; Łaska-Mierzejewska, 1982; Waliszko, unpublished).

This report presents a summary of several recent studies of the associations between socioeconomic stratification and stature and menarcheal age in Poland in the 1950s, 1960s and 1970s. Poland is particularly suitable for this type of research for several reasons. First, the population of postwar Poland, in sharp contrast to that of prewar Poland, is one of the most ethnically homogeneous national populations in Europe, with practically no linguistic, religious, or ethnic/racial minorities of any numerical significance. There is, therefore, no reason to suspect, for example, that the Polish intelligentsia differs significantly in its genetic composition from that of the other major social classes, the industrial workers or the peasants. Social mobility has been very intense in Poland since World War II, and many of the present day intelligentsia are first-generation members of this class. Thus, social gradients in growth and maturity of Polish children may safely be ascribed to inequalities in living conditions rather than to interclass genetic differences resulting from possible associations between socioeconomic status and ethnic origin. In this context, mention should be made of the massive population movements caused initially by the westward shift of Poland's borders in 1945, and subsequently by a rapid industrialization and urbanization of the country that has changed the percentages of urban and rural dwellers from 32% and 68%, respectively, in 1946, to 48% and 52%, respectively, in 1960, and to 57% and 43%, respectively, in 1978 (Rocznik Statystyczny, 1980). As a result of these demographic processes, the population of Poland, is reasonably mixed in a genetic sense. There is, for example, little regional variation in blood group frequencies (Pierzchała, 1979). Some regional variation in statures of conscripts is apparent (Górny, 1980), but it is related to socioeconomic factors.

Secondly, a large amount of growth data has been collected in Poland since the early 1950s. These data permit reconstruction of secular trends in growth within several social groups. Therefore, it is possible to describe in detail not only present social class differentials in growth, but also to trace the development of such differentials through time.

Finally, not without significance in the present context, is the fact that Poland has been a Communist-ruled country since the late 1940s. Clearly, in a political system whose *raison d'être* is said to be the transformation of the class society into a classless society, and in which egalitarianism has been declared the cornerstone of social policies, symptoms of socioeconomic stratification constitute an interesting object of study.

The data utilized in this review come from three sources: (1) anthropometric examinations of military conscripts, (2) three nationwide growth surveys in 1955, 1966, and 1978, each based on a sample of more than 20,000 school children, and (3) several surveys of menarcheal age in two large cities and several rural areas.

SOCIAL GRADIENTS IN STATURE OF MILITARY CONSCRIPTS

Perhaps the most detailed analysis of social class differences in body size in Poland is that based on a sample of 13,000 military conscripts born in 1957 and measured in 1976 (Bielicki et al., 1981a). Variation in the stature of conscripts was studied in relation

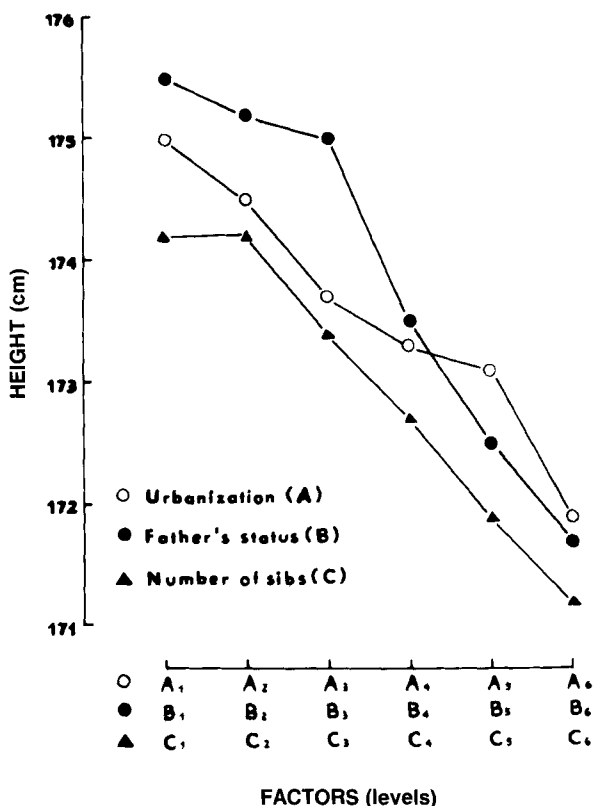


Fig. 1. Empirical regressions of the stature (cm) of Polish conscripts on three environmental variables (factors), each variable described by a six category scale. Urbanization: A₁—big cities (population over 0.5 million), A₂—smaller cities (pop. 0.1–0.5 million), A₃—medium towns (population 25,000–0.1 million), A₄—small towns (population below 25,000 but urban administrative status), A₅—villages in Upper Silesia, a heavily industrialized province in southern Poland, A₆—villages in all other regions of Poland. Father's occupational-educational status: B₁—college-educated men or those holding jobs requiring such education, B₂—technicians with secondary school vocational education, B₃—nonmanual workers without technical or academic education, B₄—skilled manual workers, B₅—unskilled manual workers, B₆—farmers (peasants). Number of children in family: C₁—one child in family through C₆—six or more children in family. Reprinted from T. Bielicki, H. Szczotka and J. Charzewski: The influence of three socio-economic factors on body height in Polish military conscripts. *Human Biology* 53(4), 1981, by permission of the Wayne State University Press.

to three socioeconomic factors, each scored on a six-point scale: (1) occupational-educational (OE) status of the father, (2) number of inhabitants of the conscript's place of residence, and (3) number of siblings in the conscript's family (family size). Mean stature decreases regularly with decreasing OE status, with decreasing size of the city or town, and with an increasing number of siblings (Fig. 1). Moreover, results of a three-factor analysis of variance show that each factor exerts a statistically significant effect on stature even after the influence of the other two factors is statistically controlled. The OE status of the conscript's father has the strongest effect, sibship size has an intermediate effect, while size of place of residence has the weakest effect on stature when considered within this three-factor model.

Two specific observations merit further comment. The first is the city-town-village gradient in stature, and particularly the relative tallness of those who live in large cities. Their tallness cannot be due solely to the fact that large cities have the highest proportion of well-educated fathers and of small families. This suggests that high urbanization in Poland is an independent growth-stimulating factor the effect of which

is added to that exerted by the educational, occupational, and demographic peculiarities of large urban populations.

The second observation is the very low position of conscripts from peasant families. They have the lowest mean stature of all six categories of OE status (Fig. 1). Further, as shown by the magnitude of the main effects of the various categories of each factor in the analysis of variance, the condition of being a son of peasants reduces stature more than the condition of being a rural dweller, and more than the condition of coming from a large family (six or more children). The shortness of peasants is especially apparent when mean statures of the lowermost social categories are compared separately within specific family sizes; i.e., two-child, three-child, and four-child families (Table 1). Sons of peasants are shorter not only than sons of small-town, unskilled manual workers and sons of rural, skilled manual workers, but even shorter than sons of *rural, unskilled* manual workers. The differences are small, but the gradient is unmistakably clear. This observation is worthy of reflection. One might expect that the unskilled, farmless, village dweller represents the very bottom of the socioeconomic hierarchy in a European industrial society. Yet, it appears that in Poland the bottom is occupied by the farmers, the social class of food producers. The low position of peasants is fully corroborated by other data, especially those for menarcheal age (see following).

The joint effect of several socioeconomic factors may produce dramatic intergroup differences in stature, as shown, for example, by Goldstein (1971) in his analysis of statural variation among London children. In the 1976 Polish sample, conscripts who are big-city dwellers, have college-educated fathers (or those holding jobs requiring such an education), and come from families with no more than two children have a mean stature of 176.5 cm. In contrast, conscripts who are rural dwellers, whose fathers are peasants, and who come from families with six or more children have a mean stature of 170.3 cm. The difference between means, 6.2 cm, is equivalent to exactly one standard deviation of stature in the total sample of conscripts, and thus must be considered very large. Note, however, that in men at the age of 19 years, it probably reflects a social difference not only in ultimate stature, but also, to a smaller extent, in the age at cessation of growth in height. The contrast would be even greater if the "uppermost" stratum were limited to high school boys from families of the Warsaw intelligentsia. In 1978 this group had a mean stature of 178.5 cm at 18 years of age (Charzewski, 1981). In Goldstein's (1971) analysis, an enormous difference of 13 cm was found in 7-year-old London children at the opposite extremes of a multifactorial scale. This maximum distance, however, is not directly comparable to that observed in Polish conscripts. In the British study, as many as eight different factors were taken into

TABLE 1. Stature of Polish conscripts at the four lowest levels of social stratification¹

Social status of father	Number of siblings	n	Mean stature	Unweighted mean stature
Small town, unskilled manual worker	2	296	172.7	172.9
	3	380	173.3	
	4	333	172.8	
Rural skilled manual worker	2	134	173.0	172.6
	3	161	173.1	
	4	125	171.8	
Rural unskilled manual worker	2	120	173.3	172.3
	3	183	171.7	
	4	177	172.0	
Peasant (farmer)	2	278	172.1	171.9
	3	508	171.8	
	4	486	171.6	

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account, including one, maternal stature, the effect of which on the child's stature is largely genetic.

SOCIAL GRADIENTS IN STATURE OF SCHOOL CHILDREN

A similar picture of marked social stratification is apparent also in the analysis of statural variation in a sample of 24,000 Polish school children examined in 1978 (Waliszko et al., 1980; Jedlińska, 1982). The sample was drawn from three types of localities: (1) three large cities, Warsaw, Łódź, and Wrocław, whose populations in 1978 were, respectively, 1.5 million, 0.8 million, and 0.7 million; (2) five small towns from five different regions of the country, each town with a population in the range of 9,000 to 12,000 inhabitants, with a population relatively stable numerically during the preceding decade, and with no large local industry; and (3) all villages in the five small administrative districts of which small towns in (2) above were the capitals.

As expected, children from large cities are taller than those from small towns, and the latter are taller than their rural age and sex peers from 7 through 18 years of age (Fig. 2). In addition to the statural gradient shown in Figure 2, the magnitude of the differences between the means, given the general characteristics of the three types of environments, should be considered. The large cities represented in this material are all industrial, administrative, academic, and cultural centers, with a high concentration of college-educated people. In Warsaw, the country's capital, there are as many as 26% college-educated men among the fathers of all 11-year-old school children in 1974 (Sokolowska et al., 1978), and the corresponding figures for Łódź and Wrocław are estimated to be between 15% and 20% (Waliszko, unpublished). One might expect that the "social distance" between the environment provided by such cities and that of small, nonindustrial, nonresort, provincial towns should be larger than the "social distance" between the latter and their *neighboring* villages. Yet, statural differences between the big cities (BC) and small towns (ST) are of similar magnitude as those between the latter and the rural villages (R) (Fig. 2). Only at adolescence do the BC-ST differences tend to exceed the ST-R differences, particularly in boys. This general pattern of differences in stature tends to persist when parental education and family size are held constant (Jedlińska, 1982).

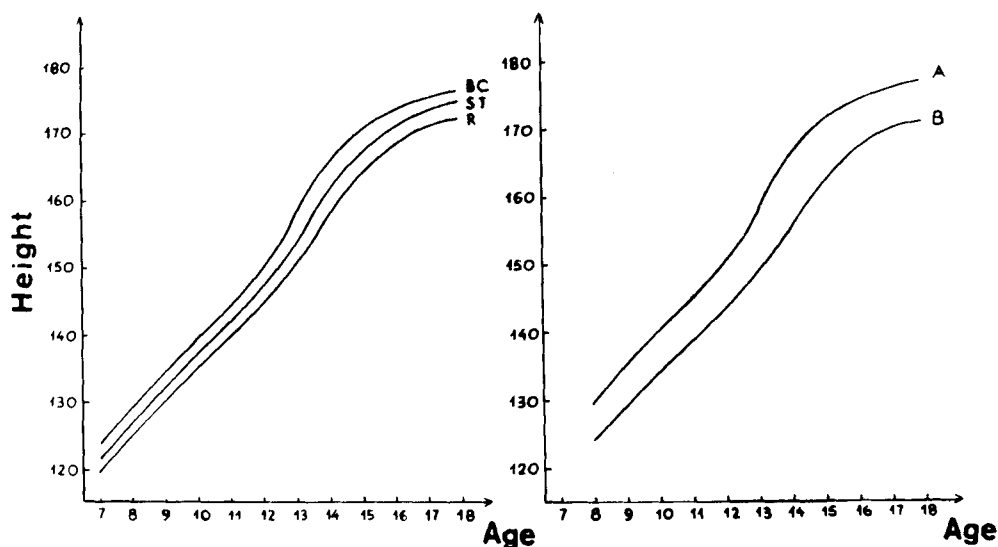


Fig. 2. Mean stature (cm) of Polish urban and rural boys. Left: boys from big cities (BC), small towns (ST) and rural areas (R). Right: (A) large city, father high school or college education, one or two children in the family; (B) rural, father elementary school education, four or more children in the family.

These findings may be interpreted as follows. Living conditions in the villages contrast sharply with those of the neighboring small towns so that residence in a small town apparently has a favorable influence on the size of preadolescents and postadolescents similar to the influence observed in comparisons of small town and large city children and youth. The "superiority" of the large city environment over the small town environment is indeed greater than the "superiority" of the latter over the rural environment with regard to the timing of the adolescent growth spurt. Although this interpretation may be questioned, the BC-ST-R statural gradient is clear, and confirms that the "degree of urbanization," at least in Poland, is a growth-influencing environmental factor that operates in part independently of parental education and family size. Moreover, the gradient confirms the economic backwardness of the rural environment of Poland.

Social contrasts in stature during adolescence are quite marked. For example, at 14 years of age, sons of men with at least a secondary education, from one or two child families and resident in large cities are, on the average, 11 cm taller than their rural age-mates from peasant families with four or more children (Fig. 2). The 11-cm difference is approximately equivalent to 1.5 standard deviations of the stature of boys of this age in large cities.

SECULAR CHANGES AND URBAN-RURAL GRADIENTS IN STATURE

Secular increases in stature in Poland have been substantial. A comparison of data from the three postwar nationwide growth surveys of 1955, 1966, and 1978 (Bielicki et al., 1981b) shows increases of about 1.0 to 1.8 cm per decade among children 7 through 18 years of age during the period between 1955 and 1978. For example, the mean stature of 17-year-old boys from large cities increased from 169.7 to 175.2 cm during this period. Corresponding changes for small town and rural boys were from 168.2 to 173.5 cm and from 165.0 to 171.0 cm, respectively. As expected, secular increases were greatest in 14-year-old boys and 12-year-old girls, i.e., at ages that coincide with mean ages of peak height velocity as estimated from over 400 individual growth curves of children born in 1953 and participating in the Wrocław Growth Study (Bielicki and Welon, 1973).

A remarkable feature of the secular increases is not their magnitude per se (cf, Roche, 1979), but the fact that the trends have been approximately parallel in all three groups across which comparisons can be made, i.e., the large city, small town, and rural areas. The rural-urban stature differences in postwar Poland show little or no tendency to decline (Fig. 3). Among boys 7 through 14 years of age, the BC-ST and the ST-V stature differences in 1978 are somewhat larger than those in 1966, while the latter are larger than those in 1955. It appears that the gap has actually increased.

Since sampling variation may influence observed secular trends, these results may reflect an artifact of sampling. In the 1978 survey, the large cities are represented by only three urban centers with populations well over half a million inhabitants each, whereas in the two earlier surveys, all cities that had more than 100,000 inhabitants were included. Hence, in the 1978 data the BC-ST statural gap may be somewhat underestimated. Such an effect, however, is unlikely, given the data for the 1976 sample of Polish conscripts discussed earlier. The differences in mean statures of conscripts from the cities in the 0.1 to 0.5 million inhabitants category and those in the more than 0.5 million category is only 0.5 cm (Bielicki et al., 1981a). Moreover, data for all other groups, which are closely comparable across surveys, i.e., the large cities in 1955 and 1966, and the small towns and rural groups in all three surveys, also do not show a distinct secular decline in the magnitude of intergroup differences in stature.

SOCIAL GRADIENTS IN MENARCHEAL AGE

A similar comparison of the data from three postwar surveys suggests that urban-rural differences in menarcheal age, unlike those in stature, show a slight tendency to decline. During the period 1955 to 1978, mean age at menarche declined from 14.3 to 13.4 years in rural village (R) girls (an estimated rate of 0.4 years per decade), from 13.9 to 13.2 years in small town (ST) girls (0.3 years per decade), and from 13.4 to 12.8 years in big city (BC) girls (0.3 years per decade). Thus, the BC-ST difference in mean

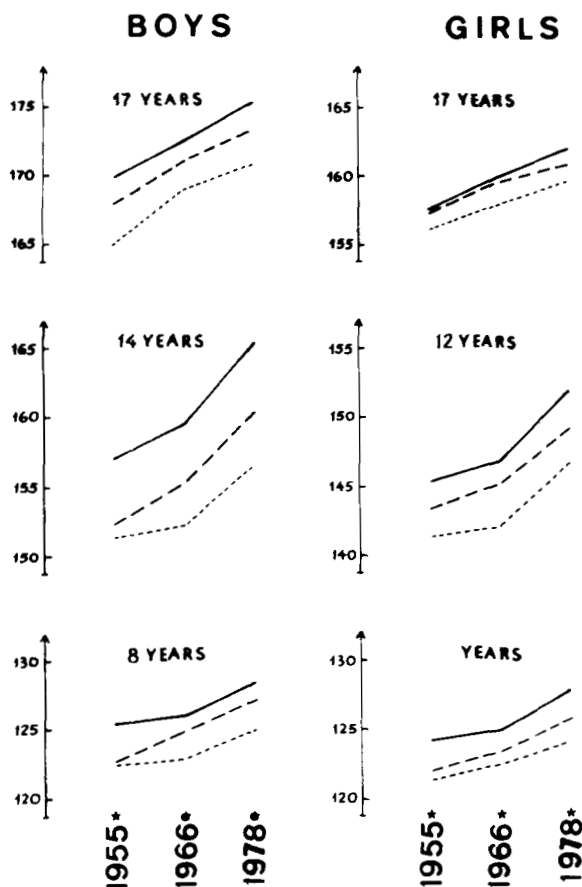


Fig. 3. Secular increases of mean stature (cm) in Polish schoolchildren at three ages: solid line, children in large cities; broken line, children in small towns; dotted line, rural children.

age at menarche has declined from 0.5 to 0.4 years, while the ST-R difference has declined from 0.4 to 0.2 years. When data from the 1966 survey, are considered also (Fig. 4), it appears that the trend in menarcheal age is approximately linear in the small town and rural groups, while girls from large cities apparently experienced a substantial decrease in menarcheal age between 1955 and 1966, followed by stability of the mean age from 1966 to 1978.

The secular trend in age at menarche of girls from large cities is difficult to explain. The 1955 survey coincided with the end of the "Stalinist era" in Poland. Oppression of the old urban intelligentsia and private business, and rapid mass migrations of rural people to large urban centers, especially to the newly-growing centers of heavy industry, characterized this period. The new regime of Władysław Gomułka, which came into power in the wake of the 1956 political upheaval, started with an abrupt abandonment of forced collectivization of farmers and with generally more liberal economic policies. Hence, the late 1950s and early 1960s saw relative prosperity and a general sense of increased socioeconomic and personal security. Whether these somewhat dramatic historical developments can serve to explain the steepness of the trends in mean menarcheal age observed in the girls from large cities during the 1955 to 1966 period, is difficult to state with certainty. What does seem certain is that the apparent *stability* of the mean menarcheal age of big city girls during the *next* decade is not due to the

Menarcheal age

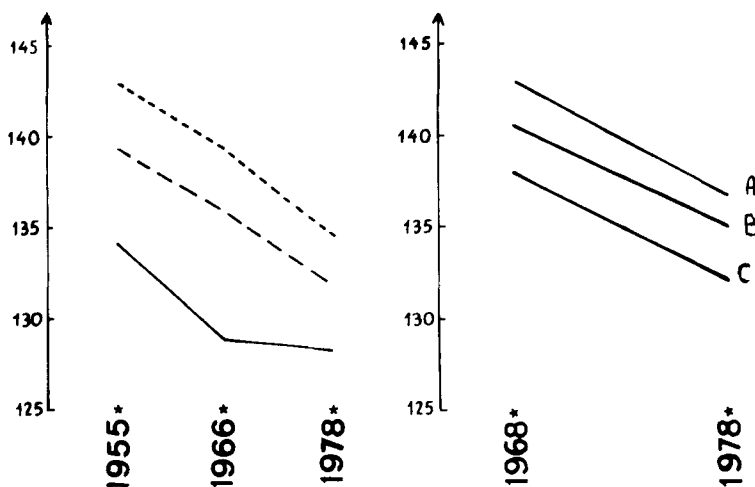


Fig. 4. Secular changes in mean menarcheal age (years) of Polish girls from different social groups. *Left*: solid line, big cities; broken line, small towns; dotted line, rural. *Right*: rural girls only: father farmer (A), father parttime farmer (B), father nonfarmer (C).

fact that (as noted above) larger urban centers represented the big city category in the 1978 survey more than in the 1966 survey, since this sampling bias should inflate rather than reduce the magnitude of the secular change.

An interesting picture of the dynamics of social differences in menarcheal age in a big city population has emerged from two surveys done in Wrocław, located in southwestern Poland, in 1966 (Milicer, 1968) and in 1976 (Waliszko, 1982). Each survey is based on a sample of approximately 6,000 schoolgirls (Table 2). The 1966 data depict a fairly typical pattern of socioeconomic stratification. Mean ages at menarche decrease with increasing educational status of the parents and with decreasing sibship age. Each of these two factors also has an independent, significant effect when the other is controlled. Moreover, age at menarche tends to be earlier in the 1966 data for daughters of those who migrated to Wrocław soon after the War than for the daughters of those who migrated later. Since the immigrants who comprised the new Polish population of this city in the years immediately following the end of World War II were from predominantly rural and small town backgrounds throughout different regions of pre-war Poland (Piasecki, 1963), the difference between daughters of early and later immigrants most likely reflects a factor labeled "length of exposure" of the family to new urban conditions, i.e., the degree of sociocultural adaptation to that environment (Milicer, 1968).

During the decade between 1966 and 1976, menarcheal age of Wrocław girls declined from 13.22 to 12.98 years, but the magnitude of the change varied in different categories (Table 2). In general, the social contrasts in menarcheal age are attenuated, but this is seemingly due primarily to a weakening of the effect of parental education. Means for lower educational groups have declined more than those for the higher educational categories. The factor of family size, however, appears to retain its importance; for example, the differences between two-child and three-child families have not declined in any of the educational groups (comparisons 4a-5a, 4b-5b, 6a-6b in Table 2). Thus it appears that in Wrocław, those elements of the within-family environment that affect the child's tempo of maturation have become, by the mid-1970s, dependent to a greater extent upon the number of children in the family than upon parental education.

TABLE 2. Median age at menarche (probit estimates) of Wrocław girls in 1966 and 1976, by parental education and occupation, and sibship size

Familial Characteristics	Median Age at Menarche ¹	
	1966	1976
1. Father college, mother at least high school	12.97	12.82
2. Both parents high school	13.16	12.90
3. Both parents at most basic vocational school	13.34	13.00
4. Two-child families	13.05	12.94
(a) father high school or college	12.91	12.91
(b) father elementary or basic vocational school	13.20	12.98
5. Three-child families	13.26	13.12
(a) father high school or college	13.23	13.20
(b) father elementary or basic vocational school	13.28	13.10
6. Both parents elementary school	13.50	13.01
(a) one- or two-child families	13.24	12.80
(b) three-child families and larger	13.58	13.19
7. Father skilled manual worker, two-child family		
(a) settled in Wrocław before 1950	13.18	—
(b) settled in Wrocław in 1950 or later	13.18	—

¹Standard errors of most medians in the table range between 0.04 and 0.07 years; highest standard error is 0.10 years.

A remarkable social gradient in menarcheal age among *rural* Polish girls was noted recently by Łaska-Mierzejewska (1982) in the course of two surveys in which the same rural schools in five different counties were studied in both 1968 and 1978. Three social categories were used, defined in terms of the father's occupation: (1) rural nonfarmers: craftsmen, landless industrial workers, teachers, and so on; (2) parttime farmers or farmer-workers: men who combine private farming with permanent or seasonal salaried jobs in industry (a substantial and growing proportion of rural dwellers in Poland); and (3) fulltime private farmers. The comparison of the 1968 and 1978 data show not only a secular acceleration of age at menarche in each of the social categories, but also persistence of a characteristic social gradient. In both surveys menarche occurs, on the average, earliest in daughters of nonfarmers, at an intermediate age in daughters of parttime farmers, and latest in daughters of farmers. The difference between the three occupational groups have *not* diminished from 1968 to 1978. The above gradient persists also when only fathers with an elementary education and with two-child or with three-child families are considered, i.e., when the factors of education and of family size are controlled.

The significance of these observations may be summarized as follows. The more a rural family relies on farming as its source of income, the more delayed is the daughter's sexual maturation as indicated by the timing of menarche. We consider this observation a further confirmation of the extremely low socioeconomic status of Polish farmers, and also as an elegant example of the utility of growth and maturation data as indicators of social inequalities and social change.

THE ECOLOGICAL INTERPRETATION OF SOCIAL GRADIENTS IN GROWTH

It would be easy to "explain" the existence of social gradients in growth and maturation by stating that they are the results of differences in living standards between the "privileged" and "underprivileged" classes, or, with perhaps somewhat more precision, that such gradients reveal obstacles that the economic situation and/or cultural habits of certain social groups present to the "full realization" of the "growth potential" of their children. Also, it is easy to note that different aspects of growth and maturation,

as well as different developmental stages, may differ in their sensitivity to a given social deficit. Problems arise, however, as soon as one attempts to go beyond such general statements, and construct a more detailed, cause-and-effect set of explanations of a *specific gradient in a particular society*. We will briefly consider some of these problems in an attempt to interpret the Polish data described in the preceding sections.

It is apparent that none of the social variables commonly used by physical anthropologists to describe socioeconomic stratification, i.e., educational or occupational status of parents, family size, degree of urbanization, or income, can directly influence the child's growth and maturity. Yet, all have been shown repeatedly to have a statistically significant effect on body size, on the tempo of growth and on maturation. All these socioeconomic variables must be viewed as influencing growth via some other "primary" environmental factors with which the social variables are correlated. Four classes of such "primary" factors are considered: (1) nutrition, (2) morbidity, (3) physical work load, and (4) growth-influencing psychological stimuli to which children are exposed in the family, at school, and in peer groups.

The question of how each of these classes of factors can affect growth constitutes one of the major problem areas of human biology, and exceeds the scope of the present article (see, for example, reviews in Tanner, 1962; Johnston, 1974; Malcolm, 1979; Malina, 1979a, 1979b; Wolański, 1970). We shall confine ourselves to a brief consideration of how the social variables commonly employed by anthropologists to define social classes or strata can influence growth and maturation. Our remarks are limited to the situation in Poland, keeping in mind that both the strength and the nature of such influences, for example, of income on nutrition, or of degree of urbanization on morbidity, may vary from country to country and from culture to culture.

Income

The possible effects of family income on the growth-influencing factors, primarily on nutrition and health, are reasonably straightforward. Official statistics of the Main Office of Statistics of Poland (Rocznik Statystyczny, 1980), which are based on analyses of household budgets, clearly show a strong correlation between annual per capita income in a household and per capita consumption of selected foods that are principal sources of animal protein, minerals, and vitamins, among other nutrients that are considered essential for growth (Table 3). It should be noted that the data are based on households of salaried workers, which may introduce a bias. Characteristically, differences in income appear to have no effect on the consumption of cheap, low-protein, high-carbohydrate foods: bread, potatoes and cereals. However, per capita expenditures on health care, education and recreation (two last rows in Table 3) increase with increasing per capita income even more dramatically than does per capita intake of most nutrients.

Number of children

The effect of this variable on growth seems relatively straightforward. Other things being equal, the amount of money available per family member tends to be lower with more children in the family. The data show that the annual per capita consumption of principal food items (meat, eggs, butter, cheese, fruits, and vegetables) in households of salaried workers and in households of private farmers declines markedly with an increase in the number of persons in a household (Rocznik Statystyczny, 1980). Since the number of persons in a household is correlated strongly with the number of children in a family, the preceding suggests sibship size may affect growth primarily through nutrition. In his analysis of statural variation among British children, Goldstein (1971) has shown that the factor of family size can be partitioned into two components: (1) parity and (2) number of younger siblings, and that each has an effect on stature after the effect of the other is statistically controlled. This interesting observation, however, does not invalidate the "economic" interpretation of the significance of the *total* number of siblings in a family, since both a greater number of younger siblings and higher parity (which essentially means a greater number of older siblings) have similar implications. Both imply the child, at some phase of his or her growth, has had to share the family's economic resources with a greater number of "competitors."

TABLE 3. *Per capita consumption of principal food items and per capita expenditure on health and cultural activities in households of salaried workers grouped by income in 1978¹*

	Annual per capita income (10 ³ zloty) ²					
	12-18	18-24	24-30	30-36	36-48	48 +
Food items						
Meat and meat products	100	114	126	135	148	165
Eggs	100	112	127	137	146	164
Cheese	100	110	124	130	140	155
Butter	100	113	120	132	143	158
Vegetables	100	113	123	132	143	162
Fruits	100	125	145	166	188	235
Milk	100	100	98	96	96	97
Animal fat	100	98	96	96	96	97
Potatoes	100	102	102	102	101	100
Hygiene and health	100	132	168	215	250	360
Education and recreation	100	150	230	300	390	600

¹Reprinted from T. Bielicki, H. Szczotka and J. Charzewski: The influence of three socio-economic factors on body height in Polish military conscripts. *Human Biology* 53(4), 1981, by permission of the Wayne State University Press.

²Consumption and expenditure are expressed as a percentage of the lowest income group.

Parental education

The mode of action of this factor on growth is more complex. It is likely that it acts largely via income and nutrition. In a detailed analysis of nutritional patterns in a large sample of school children, Konieczna (1977) observed that at the ages of 8, 11, and 14 years, cases of "inadequate" nutrition are least frequent among children of parents with secondary school education, and much more frequent among children of manual workers, urban skilled manual workers, or farmers (Table 4).

Parental education also has a strong effect on infant mortality due to exogenous causes (Table 5). By implication, one may assume that parental education has an effect on morbidity during infancy and early childhood.

It is an open question, however, as to the extent the differentials in children's nutrition or morbidity associated with parental education are caused by differences in family income. Piasecki and Panek (1982), for example, found a positive correlation between education and income for parents of 13-year-old children from the industrial city of Nowa Huta during the 1970s. However, Kędelski (1976) noted that the correlations increase with age, and that they are low and at times negative in younger families. It is possible that the effect of parental education on stature and menarcheal age of Polish children may reflect differential parental *utilization* of the available income rather than the actual *amount* of money available per member of the family. The role of such education-associated differences in managing the family budget is suggested by the observation of Wojciechowska (1977). In Poland of the mid-1960s, she noted that the likelihood of owning a refrigerator was positively correlated with a person's educational status even after allowance was made for income and social background.

Further evidence that differences in income cannot completely explain the effect of parental education on growth is shown when the mothers and fathers are considered separately. The statistical effect of the education of the mother on the growth and maturity of children is stronger than that of the education of the father (Charzewski, 1981; Piasecki and Panek, 1982).

Occupational status

Occupational status is obviously a principal determinant of family income in most industrialized societies. However, reliable data on the relationship between occupational status and living standards in Poland are not available. In the analysis of statural variation among Polish conscripts, the factor with the strongest effect on stature was the occupational-educational (OE) status of the father. The occupational component of OE status was important in defining all six categories of this variable, including the

TABLE 4. *Percentage of cases of inadequate nutrition among 9600 Polish schoolchildren 8, 11, and 14 years of age examined in 1972-1974, by educational-occupational status of father¹*

Educational-occupational status of father	Food items consumed less than three times a week					Meals irregular during the day	Diet assessed as generally inadequate	Health status of 14-year-old boys suggesting nutritional deficits
	Meat	Butter	Eggs	Vegetables high in carotene	Vegetables high in vitamin C			
College	3	2	21	53	63	16	10	25
Secondary school	3	5	20	56	65	19	12	33
Skilled manual worker	6	11	21	63	66	24	18	33
Unskilled manual worker	14	23	21	70	69	30	24	44
Farmer	27	35	22	82	75	39	32	49

¹Data compiled from Konieczna (1977), Tables 14, 21, 22, 23, 27, 29, and 34. Konieczna's criteria for nutritional status were levels of hemoglobin and hematocrit, and a general medical examination which involved specific focus on symptoms of avitaminosis and other conditions associated with nutritional status.

TABLE 5. *Infant mortality in Poland in 1975 by education of mother¹*

Education of mother	Deaths per 1000 live births	Percentage due to exogenous causes ²
College	18.6	16
Secondary	20.8	27
Vocational	24.0	35
Complete elementary	27.3	42
Incomplete elementary	56.0	52

¹From Rocznik Statystyczny Ochrony Zdrowia (1979).

²Deaths due to factors or agents from outside the infant and not due primarily to structural or functional factors.

highest level, men with college education or holding jobs requiring such education. There is good reason to suppose this latter category contains an unknown but probably substantial percentage of men with considerably less than normal academic training, since recruitment for higher posts in the administration and industry is based in part on factors other than educational and professional qualifications.

Perhaps the most significant and spectacular example of the influence of parental occupation on growth of Polish children is evident in the rural farm (peasant) families. The delayed maturation and short stature of peasant children, consistently demonstrated by many Polish surveys, is undoubtedly a reflection of the generally poor condition of Polish agriculture. For example, in the 1970s only about 4% of industrial output was devoted to the servicing of agriculture, and of this small percentage, less than one half went to individual farmers, although they hold about three-fourths of the total area of farm land.

What specific environmental deficits are responsible for the delayed growth and maturation of peasant children in Poland? The findings of Konieczna (1977) strongly suggest the importance of nutrition. Cases of inadequate nutrition are most numerous among peasant children, compared to children from all other social groups (Table 4). It is particularly noteworthy that in the quality of the diet, regularity of meals during the day, and general nutritional status, children of peasants are considerably poorer than even children of unskilled manual workers. The nutritional data in Table 4, match the statural gradient in Table 1. It should be noted that peasant children often participate in farm work and often walk long distances to school, so that their energy expenditure is greater than that of their nonpeasant age-mates. Thus, their poorer nutritional status is influenced by both poor diet and higher levels of energy expenditure.

Urbanization

Urban-rural differences in stature and menarcheal age are observed commonly in industrial societies (Eveleth and Tanner, 1976), although in some, for example, Holland and the United States, they have virtually disappeared (Hamill et al., 1972; van Wieringen, 1978). In Poland, the big city-small town-rural village gradient in stature remains when differences in parental education and family size are controlled. Thus, despite the various physical and psychosocial deficits often ascribed to the modern urban, particularly the big city, environment, there must be some aspects of this environment, or of urban lifestyles, that enhance growth in size and accelerate maturation. Urban communities, in contrast to rural ones, generally have easier access to health care facilities and also enjoy significantly better sanitary conditions. Recent Polish statistics on the quality of drinking water, and on the availability of tap water, bathrooms and water closets in urban versus rural households clearly indicate this differential (Mały Rocznik Statystyczny, 1981). Infant mortality rates in 1960 were 38/1000 among urban and 48/1000 among rural dwellers, but have declined rapidly, more so among the latter, so that by the mid-1970s the urban-rural difference had become insignificant (Mały Rocznik Statystyczny, 1981).

The effect of urbanization on growth may be indirectly related to nutrition also. In Poland, the system of food distribution has consistently favored the large urban centers at the expense of medium-sized and small towns. For example, during the second half of the 1970s, the eight largest urban centers that account for only about 20% of the population of Poland, received nearly 50% of the total meat supply available for domestic consumption.

SOCIAL GRADIENTS IN GROWTH AND THE "CLASSLESS" SOCIETY

The data present a picture of intense secular trends towards increased stature and earlier maturation, thus suggesting significant improvements in living conditions in the population as a whole. Indeed, the dramatic breakdown of Poland's economy in the early 1980s should not mask the fact that in many respects such improvements have occurred in Poland during the three postwar decades. During the 18-year period between 1960 and 1978 the following changes have occurred: infant mortality decreased from 55/1000 to 21/1000; annual per capita consumption of meat and meat products increased from 43 kg to 71 kg, butter from 4.7 kg to 8.7 kg, and eggs from 143 to 220; the number of inhabitants per room in urban apartments decreased from 1.53 to 1.10; the proportion of urban apartments with their own bathrooms increased from 26% to 70%, and those with central heating increased from 13% to 57% (Rocznik Statystyczny, 1980). The significance of these improvements cannot be overlooked. However, our concern is not on changes in living conditions as a whole, but on the socioeconomic stratification of Polish society. The data clearly show the persistence of *marked social inequalities in Poland and these have strong effects on the growth and maturation of children and youth*.

Interestingly, it is from several societies of the Western World in the 1970s that the first well-documented examples of a reduction or elimination of social class differences in child growth and maturation have been reported. Among Oslo school children in 1975, there was no relationship between stature and social category in any age group, while the mean age at menarche was slightly later in the upper compared to the lower strata (Brundtland et al., 1980). A marked secular decline of social class differences in stature also seems to have occurred in London (Cameron, 1979). In the United States, no systematic differences in stature were observed within each of two income groups, those above and those below \$3,000 per family annually, and between rural children and children from either the centers or the suburbs of large cities (Hamill et al., 1972). Perhaps the clearest example of the elimination of social gradients in growth is that reported by Lindgren (1976). Among Swedish urban children, there were no significant differences in stature, age at peak height velocity and age at menarche among social classes defined by income and father's occupation.

In commenting upon the latter finding, Tanner (1978, p. 151) remarked that data on children's growth may be considered "a meaningful measure of the classlessness of society." This statement is worthy of reflection. One might argue that the term "class-

lessness," used in the above context, can be misleading, because the Swedish example demonstrates that social gradients in growth can disappear in a society in which social classes, whether defined in terms of economic control, political power, wealth or prestige, are still very much in existence. Hence, a more pedantic interpretation of Lindgren's findings would perhaps be as follows. The living standards attained by the society as a whole are such as to make any environmental deficits inhibiting children's growth and maturation *equally rare among lower class families as among upper class ones*. Yet, Tanner's remark emphasizes something very essential. It draws attention to the fact that the physical anthropologist has at his disposal a very sensitive and reliable instrument with which he can measure the effectiveness of social policies, those practiced or claimed to be practiced, of governments and ruling political parties, even though it is not the instrument that can signal the advent of the utopia of a classless society.

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